

FIG. 1

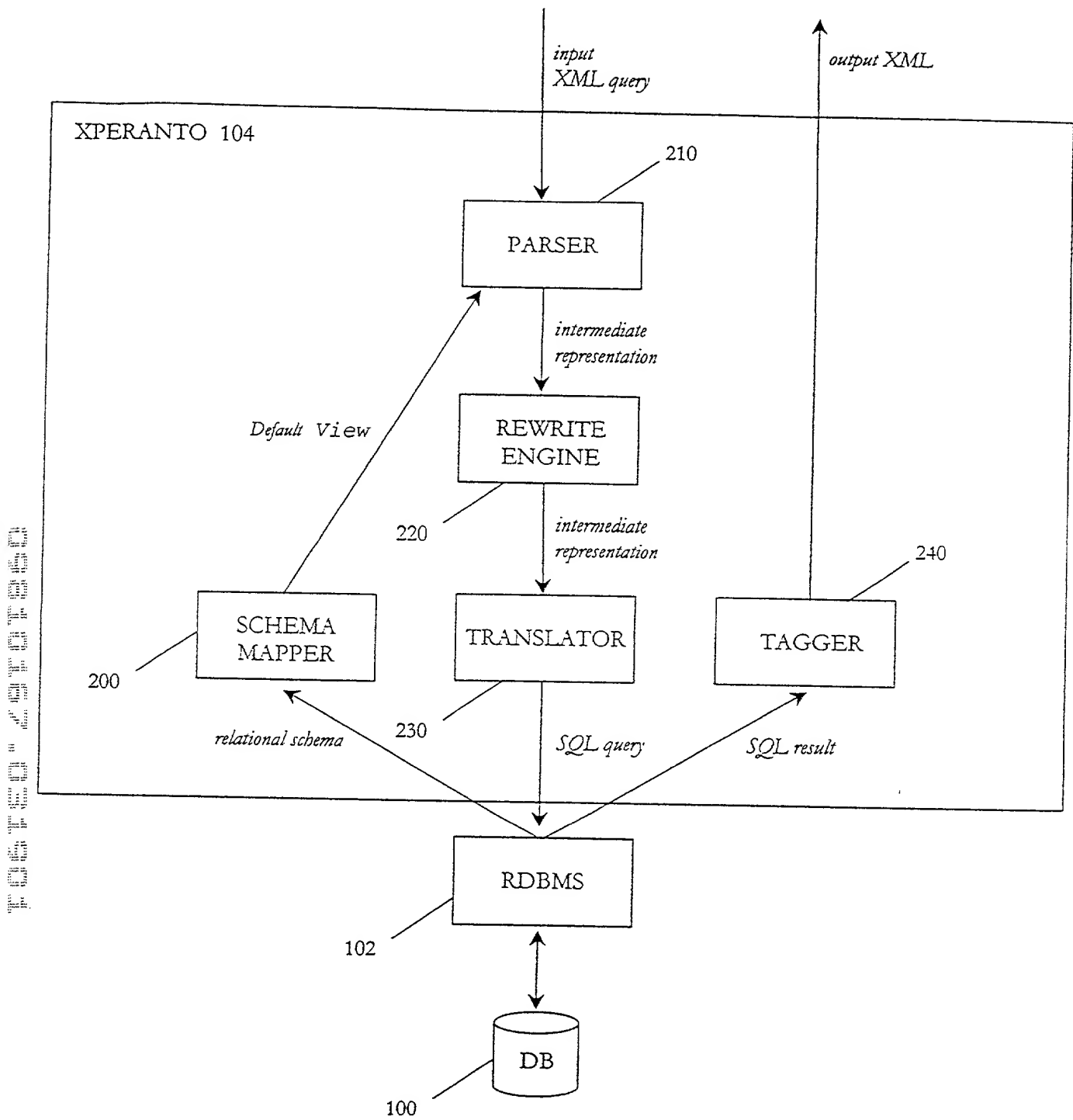


FIG. 2

DEPT TABLE 300

DNO	NAME	SIZE
1	Finance	100
2	Marketing	200
3	Sales	50
...		

EMP TABLE 310

DNO	ENO	NAME	AGE
1	1	J. Skolem	50
2	2	L. Hubbard	33
...			

Default XML View of the DEPT Table 320

```
<DEPT>
  <ROW>
    <DNO> 1 </DNO> <NAME> Finance </NAME> <SIZE> 100 </SIZE>
  </ROW>
  <ROW>
    <DNO> 2 </DNO> <NAME> Marketing </NAME> <SIZE> 200 </SIZE>
  </ROW>
  <ROW>
    <DNO> 3 </DNO> <NAME> Sales </NAME> <SIZE> 50 </SIZE>
  </ROW>
  ...
</DEPT>
```

Default XML View of the EMP Table 330

```
<EMP>
  <ROW>
    <DNO> 1 </DNO> <ENO> 1 </ENO> <NAME> J. Skolem </NAME> <AGE> 50 </AGE>
  </ROW>
  <ROW>
    <DNO> 2 </DNO> <ENO> 2 </ENO> <NAME> L. Hubbard </NAME> <AGE> 33 </AGE>
  </ROW>
  ...
</EMP>
```

FIG. 3

Query Over the Default View

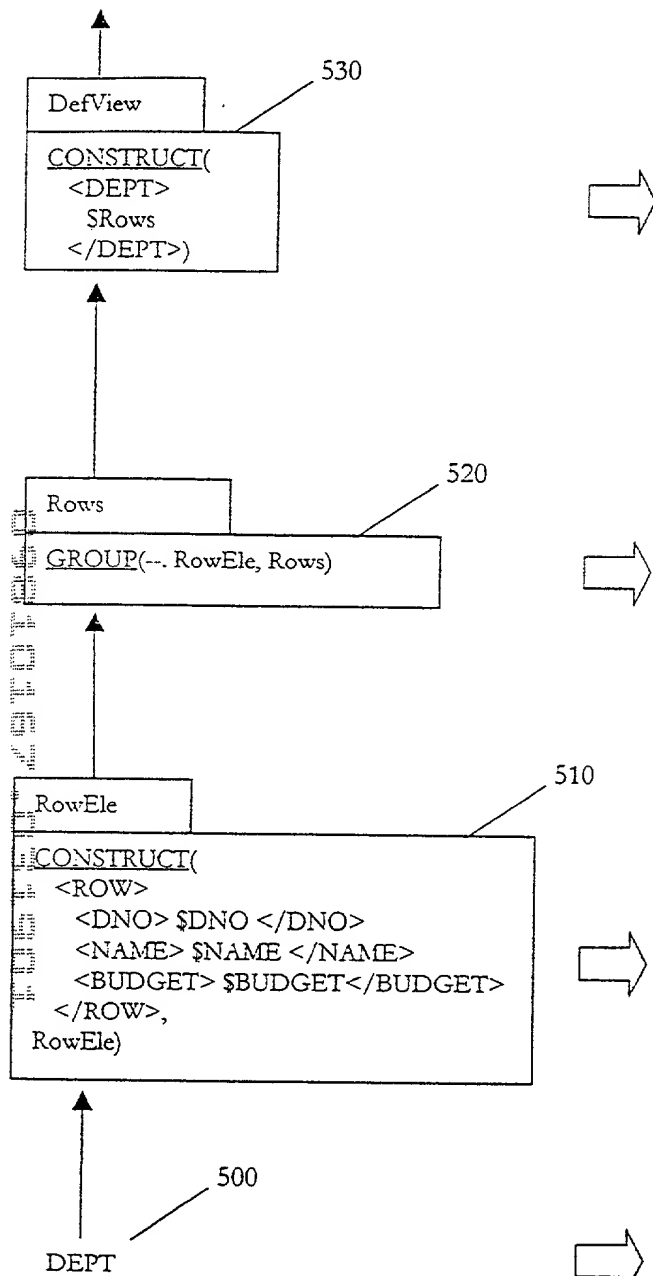
```
WHERE
  <DEPT>
    <ROW>
      <DNO> $DNO </DNO> <NAME> $DNAME </NAME>
      <SIZE> $DSIZE </SIZE>
    </ROW>
  </DEPT> IN DefaultValue,
  $DSIZE > 75
CONSTRUCT
  <BIGDEPT>
    <NAME> $DNAME </NAME>
    <SIZE> $DSIZE </SIZE>
    {WHERE
      <EMP>
        <ROW> <DNO> $DNO </DNO> <NAME> $ENAME </NAME> </ROW>
      </EMP> IN DefaultValue
    }
    CONSTRUCT
      <EMP> <NAME> $ENAME </NAME> </EMP> }
  </BIGDEPT>
```

XML Produced by the Query

```
<BIGDEPT>
  <NAME> Finance </NAME>
  <SIZE> 100 </SIZE>
  <EMP> <NAME> J. Skolem </NAME> </EMP>
  ...
</BIGDEPT>
<BIGDEPT>
  <NAME> Marketing </NAME>
  <SIZE> 200 </SIZE>
  <EMP> <NAME> L. Hubbard </NAME> </EMP>
  ...
</BIGDEPT>
...
```

FIG. 4

Intermediate Representation for the
Default View of the DEPT Table



Output of Each Operation

```

<DEPT>
  <ROW>
    <DNO> 1 </DNO> <NAME> Finance </NAME>
    <SIZE> 100 </SIZE>
  </ROW>
  <ROW>
    <DNO> 2 </DNO> <NAME> Marketing </NAME>
    <SIZE> 200 </SIZE>
  </ROW>
  ...
</DEPT>
    
```

```

<ROW>
  <DNO> 1 </DNO> <NAME> Finance </NAME>
  <SIZE> 100 </SIZE>
</ROW>
<ROW>
  <DNO> 2 </DNO> <NAME> Marketing </NAME>
  <SIZE> 200 </SIZE>
</ROW>
...
    
```

```

<ROW>
  <DNO> 1 </DNO> <NAME> Finance </NAME>
  <SIZE> 100 </SIZE>
</ROW>
    
```

```

<ROW>
  <DNO> 2 </DNO> <NAME> Marketing </NAME>
  <SIZE> 200 </SIZE>
</ROW>
    
```

...

1 Finance 100

2 Marketing 200

...

FIG. 5

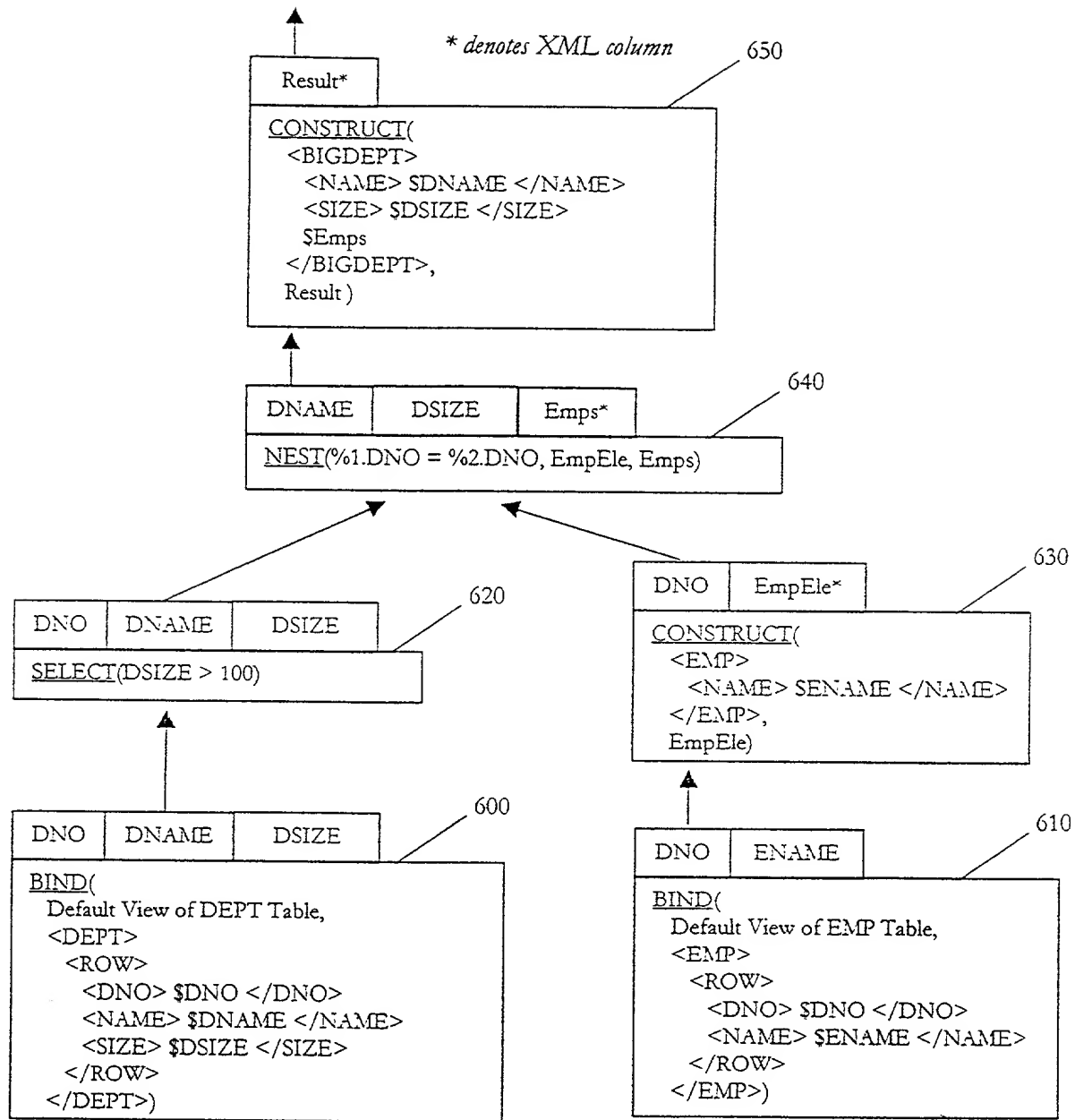


FIG. 6

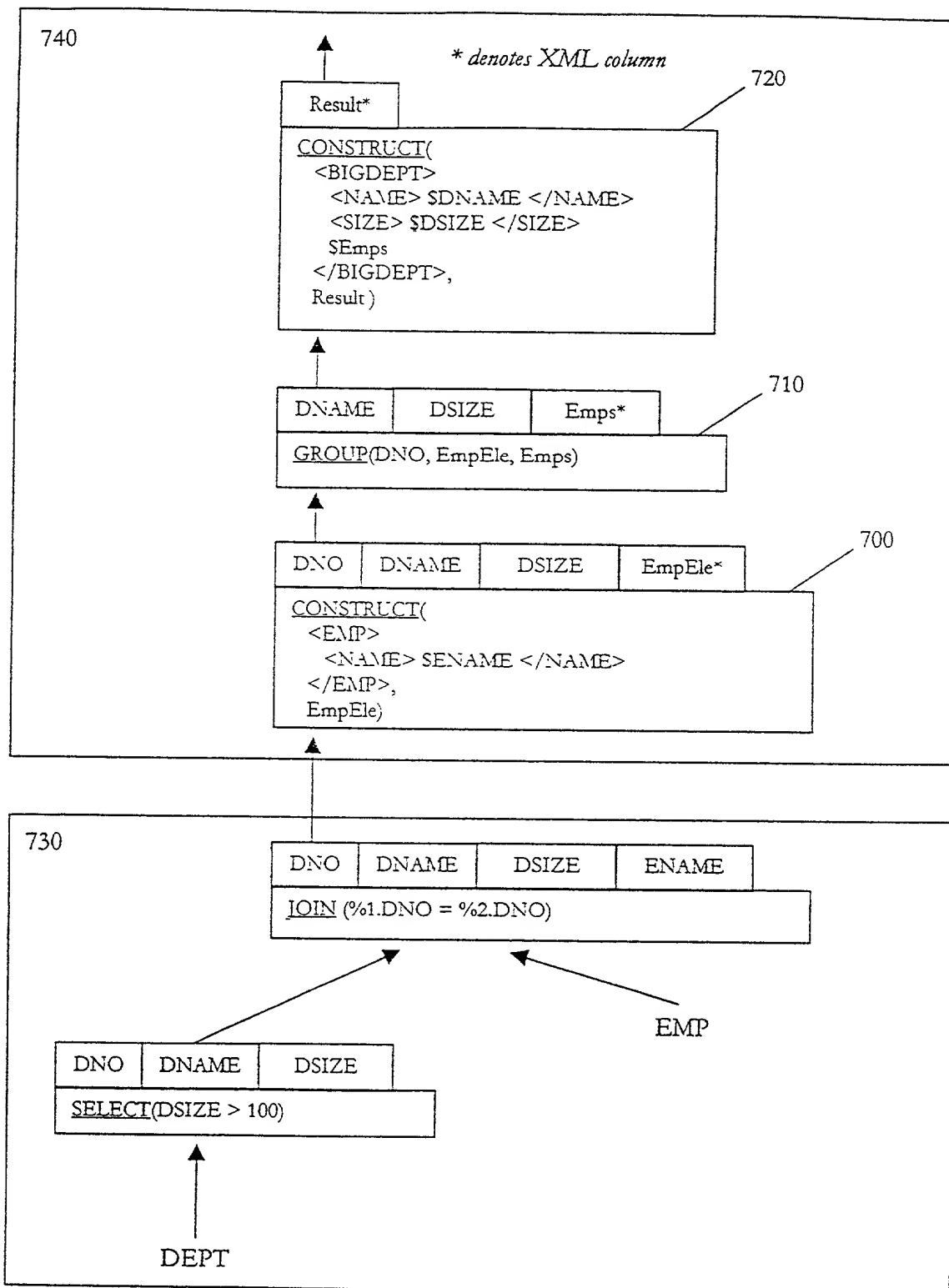


FIG. 7

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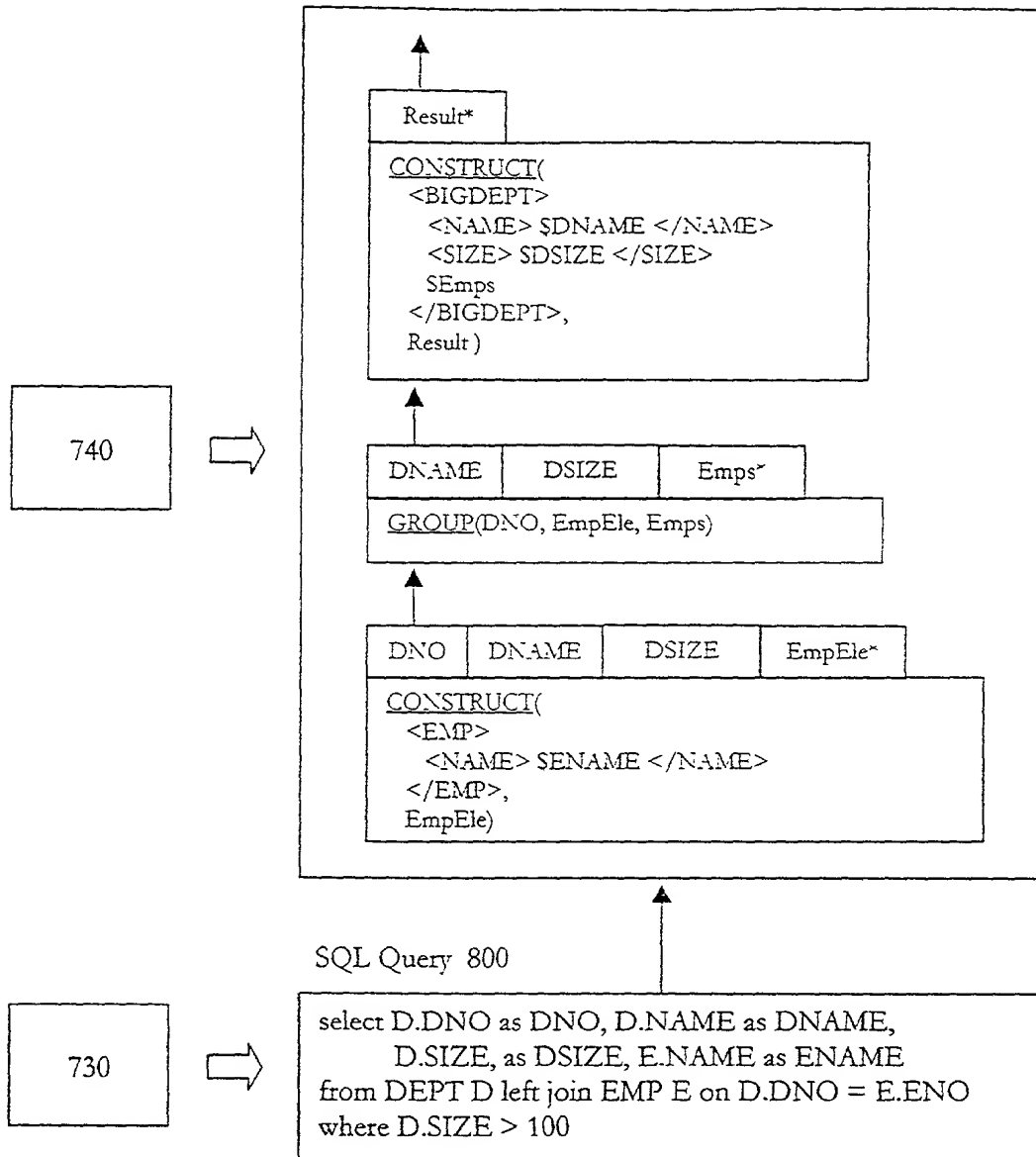


FIG. 8

Employee

<u>WORKDEPT</u>	<u>ENO</u>	<u>LASTNAME</u>
1	1	Haas
2	2	Thompson
3	3	Kwan
1	4	Lucchessi
1	5	O'Connell
3	6	Quintana
3	7	Nicholls

Figure 9a

Default XML View of the Employee Table (DefaultEmployee)

```
<EMP>
  <ROW>
    <WORKDEPT>1</WORKDEPT><ENO>1</ENO><LASTNAME>Haas</LASTNAME>
  </ROW>
  <ROW>
    <WORKDEPT>2</WORKDEPT><ENO>2</ENO><LASTNAME>Thompson</LASTNAME>
  </ROW>
  <ROW>
    <WORKDEPT>3</WORKDEPT><ENO>3</ENO><LASTNAME>Kwan</LASTNAME>
  </ROW>
  <ROW>
    <WORKDEPT>1</WORKDEPT><ENO>4</ENO><LASTNAME>Lucchessi</LASTNAME>
  </ROW>
  <ROW>
    <WORKDEPT>1</WORKDEPT><ENO>5</ENO><LASTNAME>O'Connell</LASTNAME>
  </ROW>
  <ROW>
    <WORKDEPT>3</WORKDEPT><ENO>6</ENO><LASTNAME>Quintana</LASTNAME>
  </ROW>
  <ROW>
    <WORKDEPT>3</WORKDEPT><ENO>7</ENO><LASTNAME>Nicholls</LASTNAME>
  </ROW>
</EMP>
```

Figure 9b

Department

<u>DEPTNO</u>	<u>DEPTNAME</u>	<u>SIZE</u>
1	Spiffy Computer	3
2	Planning	1
3	Information Center	3
4	Development Center	0

Figure 10a

Default XML View of the Department Table (DefaultDepartment)

```
<DEPT>
  <ROW>
    <DEPTNO>1</DEPTNO><DEPTNAME>Spiffy Computer </DEPTNAME><SIZE>3</SIZE>
  </ROW>
  <ROW>
    <DEPTNO>2</DEPTNO><DEPTNAME>Planning</DEPTNAME><SIZE>1</SIZE>
  </ROW>
  <ROW>
    <DEPTNO>3</DEPTNO><DEPTNAME>Information Center</DEPTNAME><SIZE>3</SIZE>
  </ROW>
  <ROW>
    <DEPTNO>4</DEPTNO><DEPTNAME>Development Center</DEPTNAME><SIZE>0</SIZE>
  </ROW>
</DEPT>
```

Figure 10b

Query Over Default Views

```
WHERE
  <DEPT>
    <ROW>
      <DEPTNO>$DEPTNO</DEPTNO> <DEPTNAME>$DEPTNAME</DEPTNAME>
      <SIZE>$SIZE</SIZE>
    </ROW>
  </DEPT> IN DefaultDepartment
CONSTRUCT
  <dept name=$DEPTNAME>
    <emplist>
      {WHERE
        <ROW>
          <WORKDEPT>$DEPTNO</WORKDEPT><ENO>$ENO</ENO>
          <LASTNAME>$ENAME</LASTNAME>
        </ROW>
      </EMP> IN DefaultEmployee
    CONSTRUCT
      <employee> <name> $ENAME </name> </employee>
    }
  </emplist>
</dept>
```

Figure 11a

Result of Query

```
<dept name="SPIFFY COMPUTER">
  <emplist>
    <employee><name>HAAS</name></employee>
    <employee><name>LUCCHESSI</name></employee>
    <employee><name>O'CONNELL</name> </employee>
  </emplist>
</dept>
<dept name="PLANNING">
  <emplist>
    <employee> <name>THOMPSON</name></employee>
  </emplist>
</dept>
<dept name="INFORMATION CENTER">
  <emplist>
    <employee><name>KWAN</name></employee>
    <employee><name>QUINTANA</name></employee>
    <employee><name>NICHOLLS</name></employee>
  </emplist>
</dept>
<dept name="DEVELOPMENT CENTER">
  <emplist>
  </emplist>
</dept>
```

Figure 11b

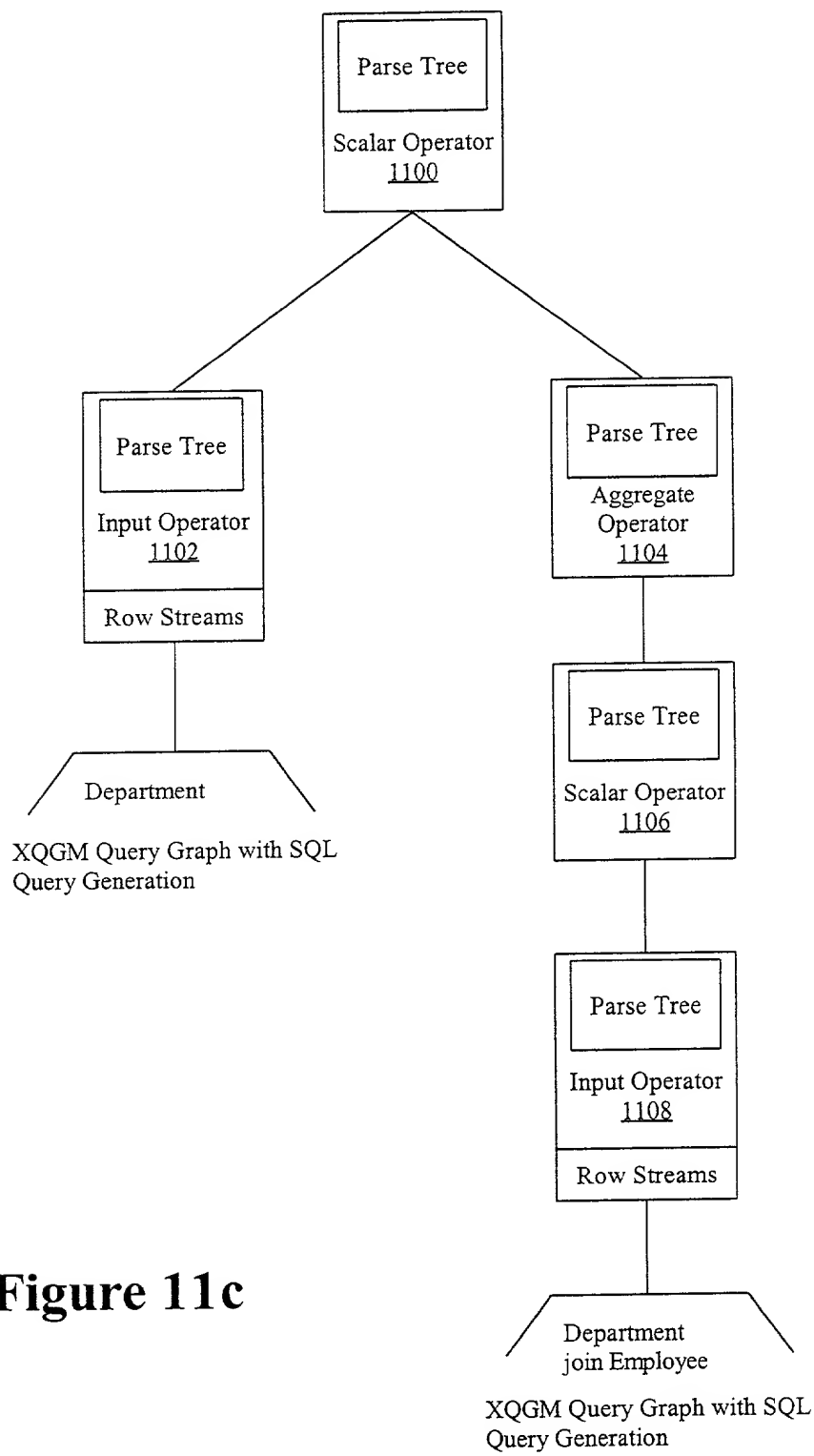


Figure 11c

Sorted Outer Union SQL Query

```

select q4.c2, q4.c3, q4.c4
from (select q3.DEPTNO, q3.DEPTNAME, cast (null as VARCHAR(15)), 0
      from DEPARTMENT AS q3
      )
union all
select q2.DEPTNO, cast (null as VARCHAR(29)), q2.LASTNAME, 1
from (select q1.LASTNAME, q5.DEPTNO
      from EMPLOYEE AS q1,
           DEPARTMENT AS q5
      where (q5.DEPTNO = q1.WORKDEPT))
      AS q2(LASTNAME, DEPTNO))
AS Q4(DEPTNO, DEPTNAME, LASTNAME, INDICATOR)
order by DEPTNO, INDICATOR

```

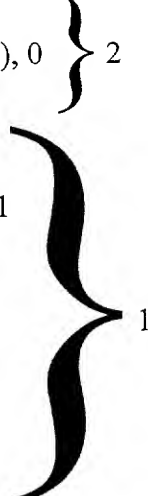


Figure 12a

Result of 1

<u>DEPTNO</u>	<u>'NULL'</u>	<u>LASTNAME</u>	<u>'INDICATOR'</u>
1	null	Haas	1
2	null	Thompson	1
3	null	Kwan	1
1	null	Lucchessi	1
1	null	O'Connell	1
3	null	Quintana	1
3	null	Nicholls	1

Figure 12b

Result of 2

<u>DEPTNO</u>	<u>DEPTNAME</u>	<u>'NULL'</u>	<u>'INDICATOR'</u>
1	Spiffy Computer	null	0
2	Planning	null	0
3	Information Center	null	0
4	Development Center	null	0

Figure 12c

Result of Union

<u>DEPTNO</u>	<u>DEPTNAME</u>	<u>LASTNAME</u>	<u>INDICATOR</u>
1	Spiffy Computer	null	0
2	Planning	null	0
3	Information Center	null	0
4	Development Center	null	0
1	null	Haas	1
2	null	Thompson	1
3	null	Kwan	1
1	null	Lucchessi	1
1	null	O'Connell	1
3	null	Quintana	1
3	null	Nicholls	1

Figure 12d

Result of Order

<u>DEPTNO</u>	<u>DEPTNAME</u>	<u>LASTNAME</u>	<u>INDICATOR</u>
1	Spiffy Computer	null	0
1	null	Haas	1
1	null	Lucchessi	1
1	null	O'Connell	1
2	Planning	null	0
2	null	Thompson	1
3	Information Center	null	0
3	null	Kwan	1
3	null	Quintana	1
3	null	Nicholls	1
4	Development Center	null	0

Figure 12e

Result of Sorted Outer Union Query

<u>DEPTNAME</u>	<u>LASTNAME</u>	<u>INDICATOR</u>
Spiffy Computer	null	0
null	Haas	1
null	Lucchessi	1
null	O'Connell	1
Planning	null	0
null	Thompson	1
Information Center	null	0
null	Kwan	1
null	Quintana	1
null	Nicholls	1
Development Center	null	0

Figure 12f

Node Strip SQL Query

```
select q1.DEPTNO, q1.DEPTNAME  
from DEPARTMENT AS q1  
order by q1.DEPTNO  
}
```

1

```
select q2.LASTNAME, q2.DEPTNO  
from (select q3.LASTNAME, q4.DEPTNO  
      from EMPLOYEE AS q3,  
           DEPARTMENT AS q4  
      where (q4.DEPTNO = q3.WORKDEPT))  
AS q2(LASTNAME, DEPTNO)  
order by q2.DEPTNO  
}
```

2

Figure 13a

Result of Node Strip (1)

<u>DEPTNO</u>	<u>DEPTNAME</u>
1	Spiffy Computer
2	Planning
3	Information Center
4	Development Center

Figure 13b

Result of Node Strip (2)

<u>LASTNAME</u>	<u>DEPTNO</u>
Haas	1
Lucchessi	1
O'Connell	1
Thompson	2
Kwan	3
Quintana	3
Nicholls	3

Figure 13c

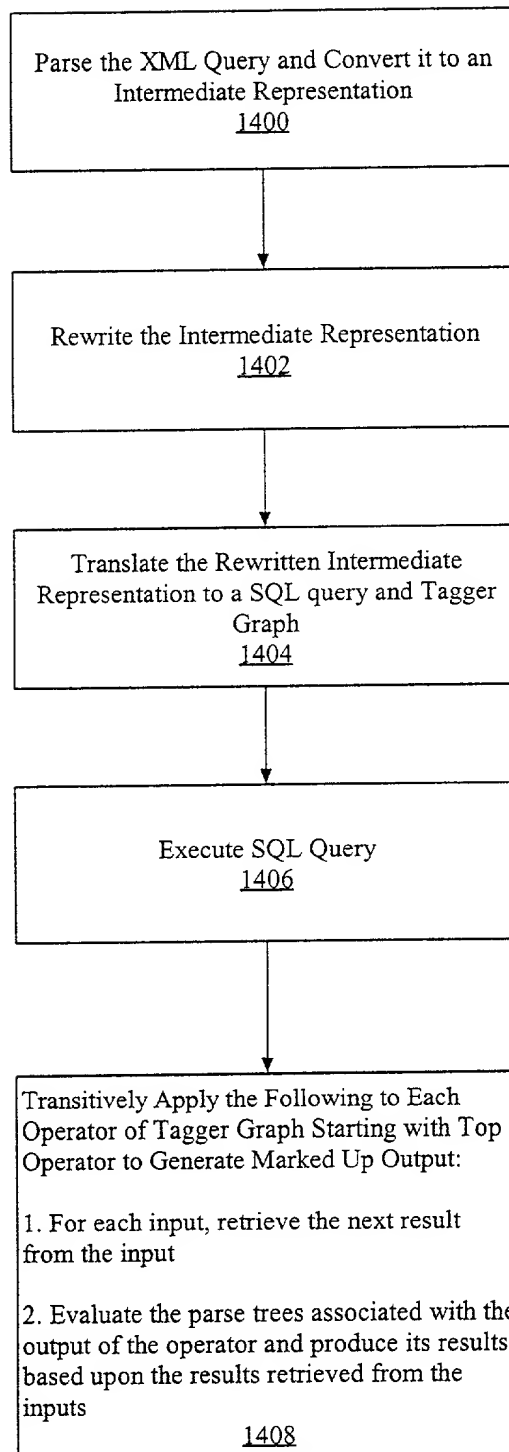


Figure 14